# A Rational Regulatory Policy for Invasive Species

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*ERS Symposium on Invasive Species*

*May 12, 2003*

# Rational Decisionmaking

- Risk assessments—often conducted *ex ante* to aid in development of regulatory policy
- Cost/benefit analysis—most often done *ex post* to justify for regulatory action (OMB Executive Order 12866)
- Rarely is attempt made to integrate the two for rational decisionmaking

# Optimal Regulatory Policy

- "Acceptable" policies:
  - E(Benefits) ≥ E(Costs)
  - Consistent w/ Executive Order 12866
- Optimal policies:
  - E(MB) = E(MC)
  - Maximizing expected net benefits

# Model of Quarantine Policy

(1) $$EW = pW_D + (1 - p)W_N$$

(2) $$EW(\phi) = p(\phi)W_D(\phi) + (1 - p(\phi))W_N(\phi) - C(\phi)$$

(3) $$\frac{\delta \mathrm{E}\, W(\phi)}{\delta \phi} = 0$$

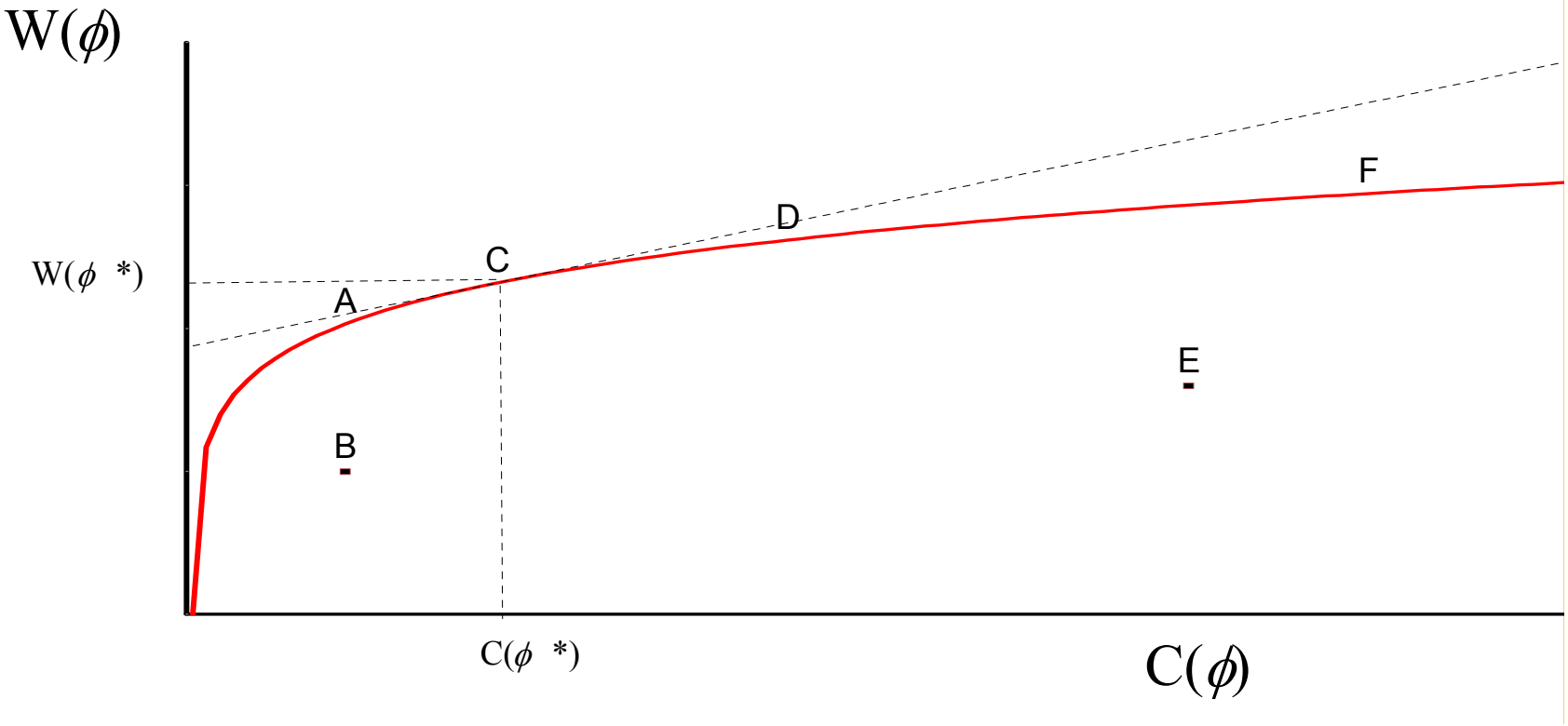
(4) $$p'(\phi)W_D(\phi) + p(\phi)W_D'(\phi) - p'(\phi)W_N + (1 - p(\phi))W_N'(\phi) - C'(\phi) = 0$$

(5) $$p'(W_D - W_N) = C' - [pW_D' + (1 - p)W_N']$$

# Model

*Figure 1*

Optimal quarantine policy



# Issues in Empirical Modeling

- Importance of properly measuring baseline
  - "Ambient" levels of risk
- Importance of properly characterizing costs and benefits
  - Welfare measures vs measures of economic activity (e.g., value of production, exports)
- How to treat uncertainty surrounding risk assessments (*Viscusi*)
- Accounting for compliance
- Paucity of data

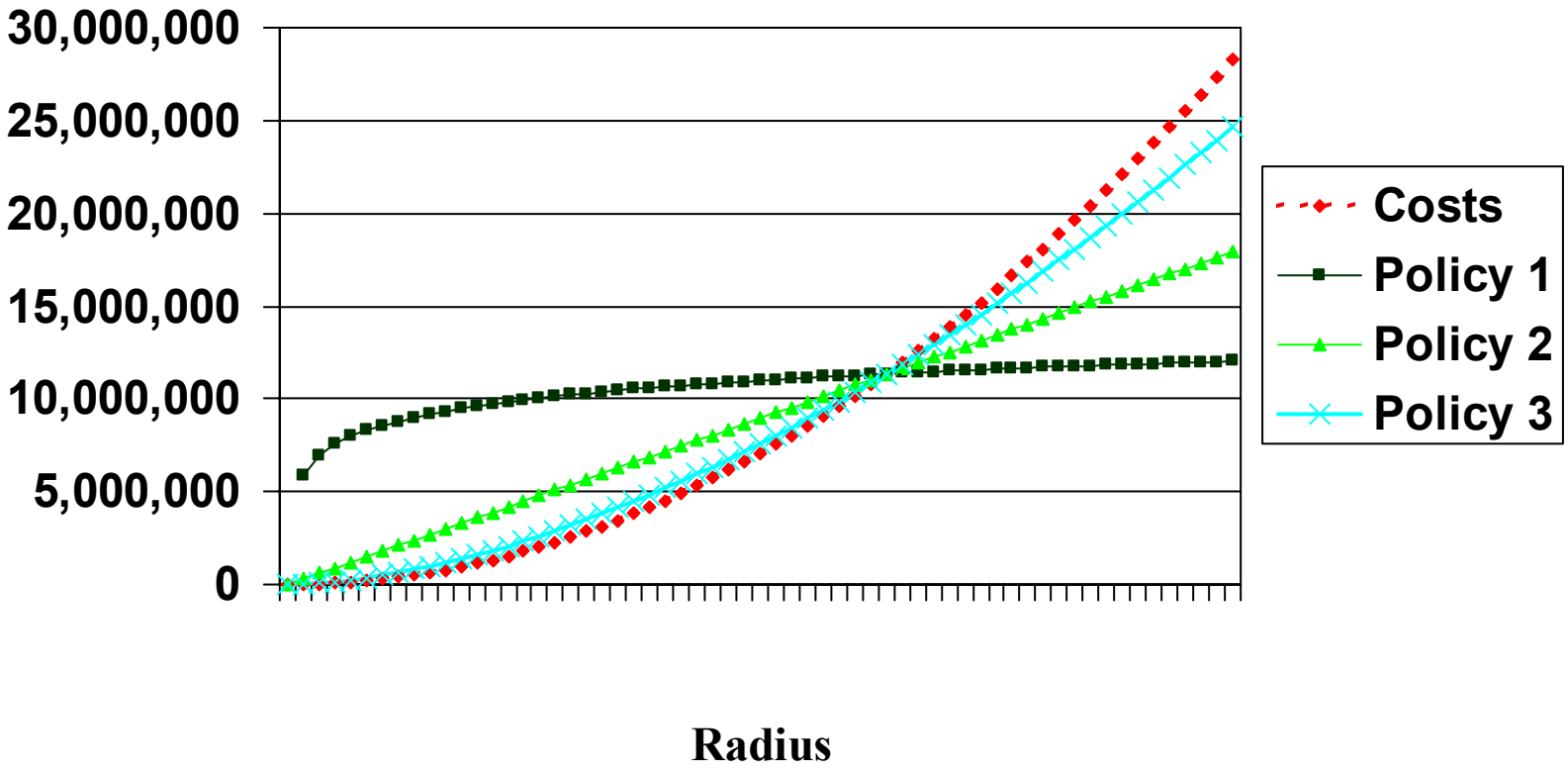
# Application

- Plant pests/diseases
  - Citrus canker
  - Karnal bunt
  - Plum pox
  - Asian longhorn beetle
- Animal diseases
  - FMD, Hog cholera, avian influenza
  - Destruction vs vaccination

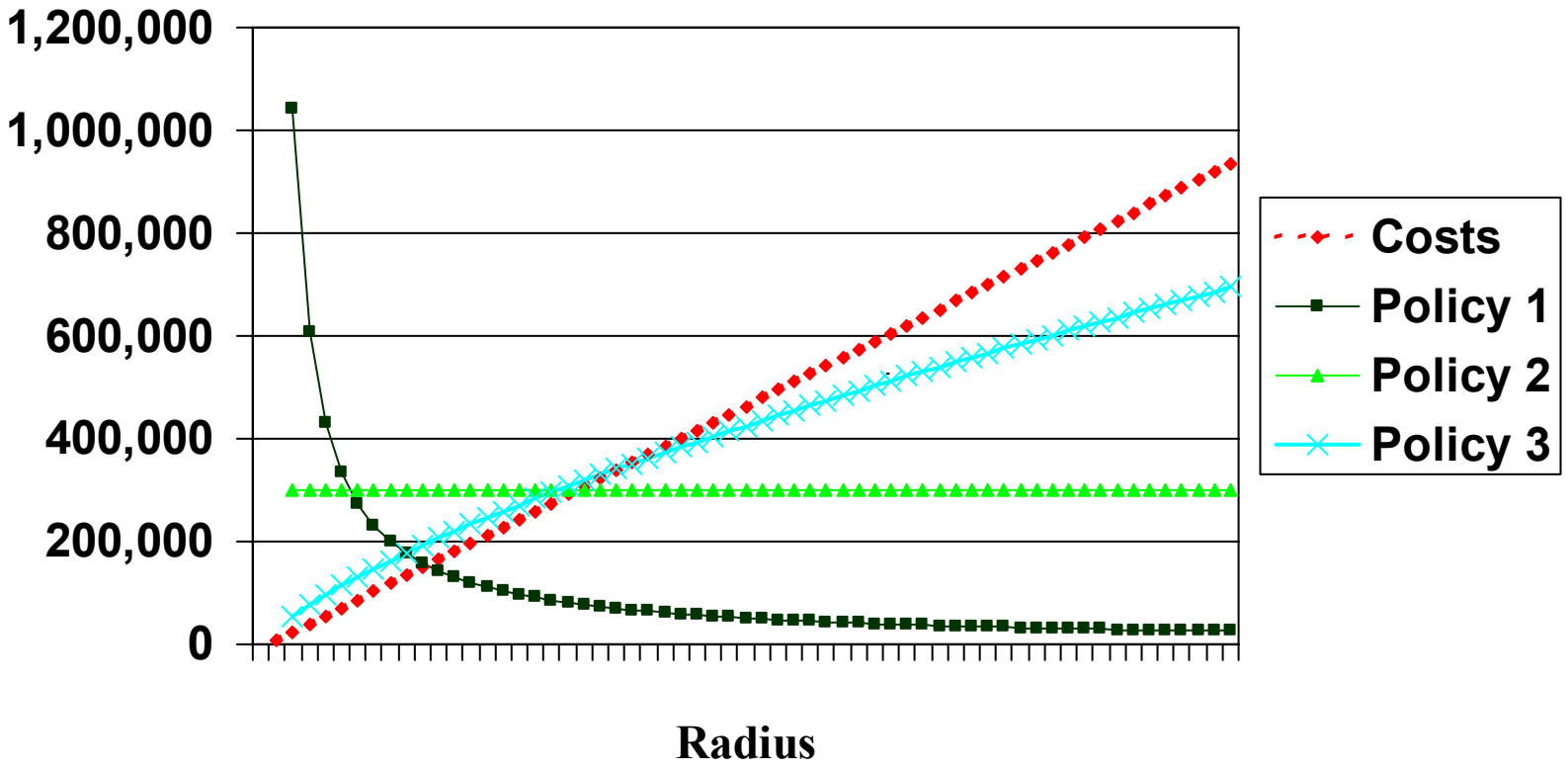
# Citrus canker

- 125’ radius vs 1,900’ radius
  - Substantial increase in area affected (1.1 acres vs 260.4 acres)
- controversial—affected homeowners seek injunction
- Court draws heavily on risk assessment (*Gottwald et al.)*

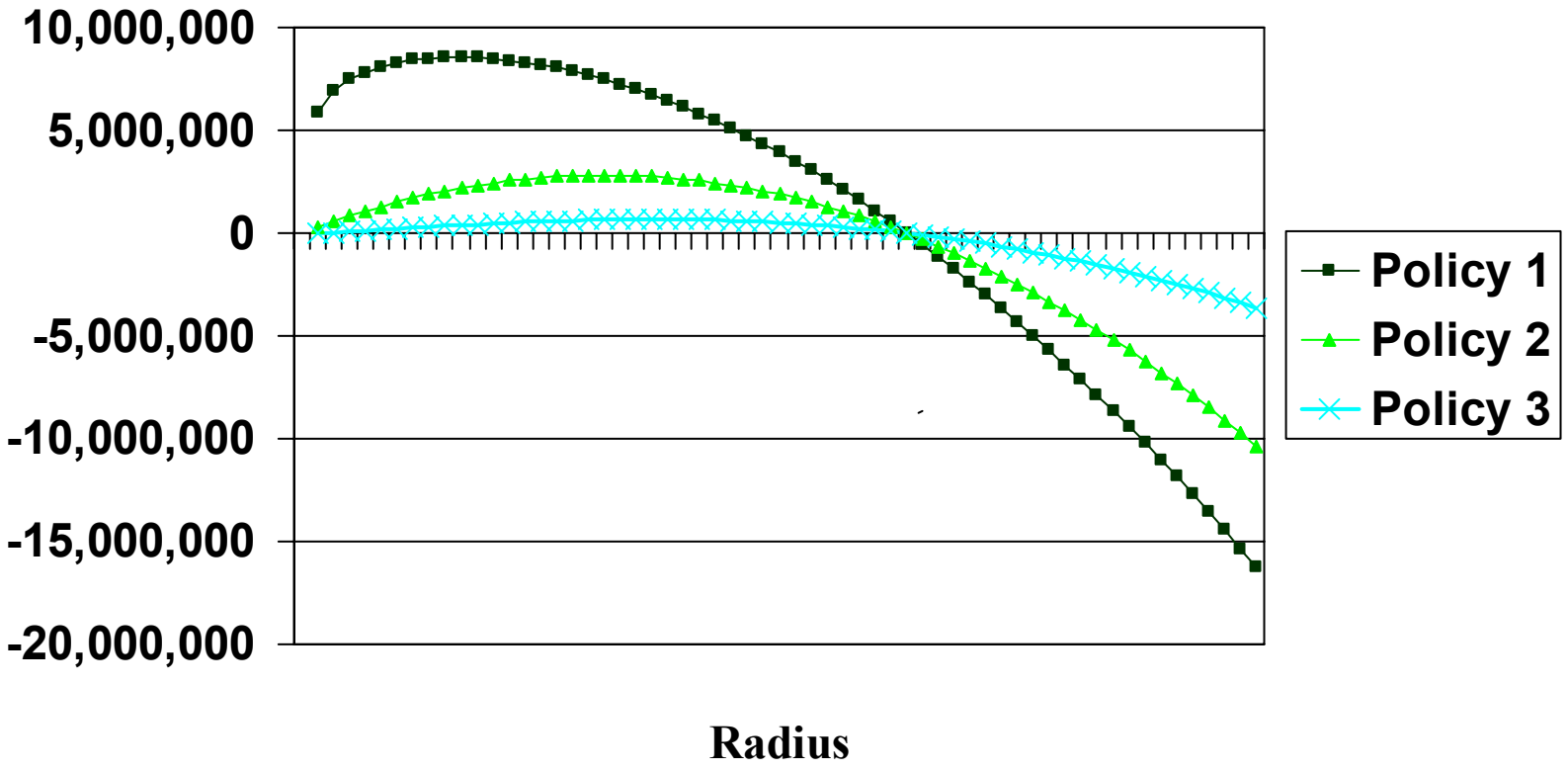
# Costs and Benefits



# Marginal Costs and Benefits



# Net Benefits



# Karnal bunt

- Extensive risk assessments (*Podleckis/Firko)*
- Policies chosen to minimize probability of outbreak
- Cost/benefit used to justify rule, but not explicitly considered in policy making
- Result: “suboptimal policy” Marginal costs exceeded marginal benefits for a number of protocols put into place (*Glauber and Narrod*)

**Table 7–Expected costs and benefits of alternative quarantine actions (million dollars)**

| Quarantine Option | Expected benefits | Expected costs | Net |
|---|---|---|---|
| Option 1--Baseline 1/ | 1,901.5 | 5.4 | 1,896.1 |
| Option 2--Railcar cleaning | 2,011.4 | 6.0 | 2,005.5 |
| Option 3–Restrictions on seed movement | 1,904.3 | 11.4 | 1,892.9 |
| Option 4–Millfeed treatment | 1,901.7 | 33.4 | 1,868.3 |
| Option 5–Railcar cleaning; restrictions on seed movement | 2,014.3 | 12.0 | 2,002.3 |
| Option 6–Railcar cleaning; millfeed treatment | 2,011.6 | 34.0 | 1,977.6 |
| Option 7–Restrictions on seed movement; millfeed treatment | 1,904.3 | 39.4 | 1,864.9 |
| Option 8–Railcar cleaning; restrictions on seed movement; millfeed treatment | 2,014.5 | 40.0 | 1,974.5 |

1/ Includes prohibition of movement of positive testing grain and seed from quarantined area; all negative testing grain and seed moved in sealed hopper cars; all combines disinfected before leaving quarantined area.

*Source: Glauber and Narrod*

**Table 8–Marginal costs and benefits of alternative quarantine options (million dollars)**

| Quarantine option | Marginal cost | Marginal benefit–probability of outbreak evaluated at: | |
|---|---|---|---|
| | | Mean | 95% percentile |
| Option 1--Baseline | 5.4 | 1,901.5 | 1,626.7 |
| Option 2--Railcar cleaning | 0.6 | 110.0 | 374.1 |
| Option 5–Railcar cleaning; restrictions on seed movement | 6.0 | 2.8 | 10.0 |
| Option 8–Railcar cleaning; restrictions on seed movement; millfeed treatment | 28.0 | 0.2 | 0.3 |

*Source: Glauber and Narrod*

# Implications for IS

- Where possible, integrate risk assessments to analyze *expected* costs and *expected* benefits
- Proper measurement of baseline risks
- Explicit assumptions on risk premium
- Compensation should be used to ensure compliance—not to offset suboptimal policy

Invasion of the Regulatory Economists